A new subspecies of *Parnassius charltonius* Gray, 1852 from the Turkestansky Mountains range (Lepidoptera, Papilionidae)

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Abstract: A new subspecies, *Parnassius charltonius* ***platon*** **ssp. n.**, from the Turkestansky Mts. range, is described; holotype male deposited in Zoological Institute of Russian Academy of Sciences in St.-Petersburg. A short comparative diagnosis is given to all taxa of the *romanovi* subspecies-group: *Parnassius charltonius romanovi* Grum-Grshimailo, 1885, *P. ch. vaporosus* Avinov, 1913, *P. ch. ljudmilae* Lesin & Kaabak, 1991, *P. ch. aenigma* Dubatolov & Milko, 2003, *P. ch. eugenia* Churkin, 2009, *P. ch. sochivkoi* Churkin, 2009, *P. ch. varvara* Churkin, 2009.

Keywords: new taxon, *romanovi*-complex, hostplant, *Corydalis*, trophic links, Pamir-Alai.

Новый подвид *Parnassius charltonius* Gray, 1852 из Туркестанского хребта (Lepidoptera, Papilionidae)
(Сочивко А. В. и Каабак Л. В.)

Резюме. В статье описывается новый подвид аполлона Чарльтона, *Parnassius charltonius* ***platon*** ssp. n., обнаруженный в центральной части Туркестанского хребта; голотип (самец) хранится в Зоологическом институте РАН в Санкт-Петербурге. Приводится краткий сравнительный диагноз со всеми таксонами группы подвидов *romanovi: Parnassius charltonius romanovi* Grum-Grshimailo, 1885, *P. ch. vaporosus* Avinov, 1913, *P. ch. ljudmilae* Lesin & Kaabak, 1991, *P. ch. aenigma* Dubatolov & Milko, 2003, *P. ch. eugenia* Churkin, 2009, *P. ch. sochivkoi* Churkin, 2009, *P. ch. varvara* Churkin, 2009.

Eine neue Unterart von *Parnassius charltonius* Gray, 1852 aus dem Turkestanskyi Khrebet (Lepidoptera, Papilionidae)

Zusammenfassung: Eine neue Unterart, *Parnassius charltonius* ***platon*** **ssp. n.,** aus dem Turkestanskyi Khrebet (Gebirge) wird beschrieben; der männliche Holotypus wird im Zoologischen Museum der Russischen Akademie der Wissenschaften in St. Petersburg aufbewahrt. Die neue Unterart wird vergleichen mit den anderen Unterarten aus der *romanovi*-Subspeciesgruppe: *Parnassius charltonius romanovi* Grum-Grshimailo, 1885, *P. ch. vaporosus* Avinov, 1913, *P. ch. ljudmilae* Lesin & Kaabak, 1991, *P. ch. aenigma* Dubatolov & Milko, 2003, *P. ch. eugenia* Churkin, 2009, *P. ch. sochivkoi* Churkin, 2009, *P. ch. varvara* Churkin, 2009.

Introduction

The systematic study of the Pamir-Alaian Lepidoptera fauna in 2003–2010 by the entomologists Leonid Kaabak, Andrey Sochivko and Victor Lesin results in discovery of a series of new populations of *Parnassius charltonius* Gray. Significant findings were made in relation to trophic links between this species and its hostplants from the genus *Corydalis* DC., and the patterns of altitude distribution of the populations were clarified.

In the summer of 2009 our group studied the territory from the Central and Inner Tian-Shan to the eastern part of the Turkestansky Mts. range within the borders of Kyrgyzstan. Many *P. charltonius* specimens were collected from several localities of the northern macroslopes of the Alai and Turkestansky Mts. ranges. Along their entire length these ranges provide a broad diversity of biotopes inhabited by different endemic species of non-tuberous perennial xerophilic *Corydalis* species belonging to the section *Strictae* (Fedde) Wendelbo 1974 and characteristic of the Pamir-Alai mountain system (Mikhailova 1982). The magnificent canyon of the Sokh River distinctly separates the mentioned ranges. Field work in the river basin area undertaken in 2009 by the first author resulted in an unexpected and very interesting finding: these *Corydalis* species — the hostplants of *P. charltonius* — do not grow in this canyon; they were only found further to the west, in the central part of the Turkestansky Range, at the Tajikistan border. Therefore, the populations of the butterflies in Turkestansky Range became isolated from the eastern group of populations inhabiting Alai and Transalai mountain ranges.

In June 2010 an additional material was collected by us from this area: L. Kaabak during his field research collected the butterflies on Kyrgyzstan territory, whereas A. Sochivko, V. Lesin and E. Fominykh worked on adjacent territory in Tajikistan. This material confirms a consistency of principal morphological futures of these butterflies and their trophic links, and we describe them here as a new subspecies. This new subspecies is included in the *romanovi*-complex (according to Kreuzberg 1985), with the name-giving taxon being *P. ch. romanovi* Grum-Grshimailo, 1885.

S. Churkin (2009) in his revision of the Middle-Asian subspecies group of *P. charltonius* designated the lectotype of *P. ch. romanovi* Gr.-Gr., 1885 and eliminated the misidentifications which occurred concerning the description of this taxon. At the same time, 3 new subspecies of *P. charltonius* from the northern Pamir-Alai and the adjacent part of the Inner Tian-Shan were described in this paper, and detailed comparative diagnosis was also given. Thus, the *romanovi*-complex is enlarged to 8 subspecies (including the one described here): *P. ch. romanovi* Grum-Grshimailo, 1885, *P. ch. vaporosus* Avinov, 1913, *P. ch. ljudmilae* Lesin & Kaabak, 1991, *P. ch. aenigma* Dubatolov & Milko, 2003, *P. ch. eugenia* Churkin, 2009, *P. ch. sochivkoi* Churkin, 2009, *P. ch. varvara* Churkin, 2009, and *P. ch. platon* ssp. n. (see Map of type localities and Figs. 1–4 and 7–20). Our many years of experience in researching the population diversity and differentiation of *P. charltonius* lead us to state that the distribution areas of the majority of the mentioned subspecies have sufficiently distinct border

lines. We would also like to suggest that *P. ch. aenigma* should be moved to another group, but this will require further research.

The holotype and two paratypes (♂♀) of the new taxon will be deposited in Zoological Institute of Russian Academy of Sciences in St.-Petersburg. Other paratypes are held in the private collections of A. Sochivko, L. Kaabak, V. Lesin, S. Churkin, V. Ganson (Moscow), V. Titov (Zhukovsky), B. Khramov (St.-Petersburg).

Abbreviations: fw. — forewing; HT — holotype; hw. — hindwing; PLT — paralectotype; PT[s] — paratype[s]; TPT — topotype; ups. — upperside; uns. — underside; wsp. — wingspan.

Systematic part

Parnassius charltonius platon ssp. n.

(Figs. 1–3)

Holotype ♂: SW Kyrgyzstan, Turkestansky Mts. Range, Sarkat River, 1500 m above s. l., 15. VII. 2009, A. Sochivko leg.; deposited in Zoological Institute of Russian Academy of Sciences in St.-Petersburg.

Paratypes: 29 ♂♂, 7 ♀♀, the same data as in the holotype, 1500–1800 m above s. l., 12.–18. VII. 2009, A. Sochivko leg.; 2 ♂♂, 2 ♀♀, the same data, 1700–1800 m above s. l., 12.–18. VII. 2009, L. Kaabak leg.; 6 ♂♂, 2 ♀♀, the same data, V. Lesin leg.; 16 ♂♂, 6 ♀♀, the same data, 20.–27. VII. 2010, L. Kaabak leg.; 8 ♂♂, 4 ♀♀, N. Tajikistan, Turkestansky Mts. Range, Jangiaryk River, 1900 m above s. l., 26.–27. VII. 2010, A. Sochivko leg.; 5 ♂♂, 5 ♀♀, the same data, V. Lesin leg.

Etymology. The new subspecies is named after Platon Pen'koff, a kind-hearted and wise person, the grandfather of the first author, A. Sochivko.

Description

Generally, the new subspecies is smaller than the majority of other subspecies, has a stable wing pattern which varies only in minor details. The sexual dimorphism is moderate and is manifested in slight differences in the size of the specimens, wing shape, and intensity of wing pigmentation.

♂: fw. length 39 mm in the HT (wsp. 70 mm), 34–39 mm in PTs (wsp. 60–71 mm). The ground colour is whitish, not bright, with yellowish-gray tint. The apex of the fw. is not sharpened, the external side of the wing is rounded. The pattern is well expressed and developed, moderately contrasting. The semitransparent marginal band is 4–4.5 mm wide at the upper part, its internal margin being even and smooth, not crescent-shaped, with a more or less distinct projection in the field M1–3. All ♂♂ have a full, wide submarginal band (a character which was known in the past for *P. ch. ljudmilae* only). It is semitransparent, too, insignificantly darker and thinner than the marginal band (3.5–4 mm in its upper part), not crescent-shaped, smoothly curved, without any sharp break at vein M2, and is separated from the marginal band by an equally wide (about 2 mm) field of light background colour. The postdiscal band is usually narrower in its upper part than the submarginal band and has contact with the latter at vein M2. In its middle part, between veins 3 and Cu2, the postdiscal band is less developed and very wavy; in the lower part it is arc-shaped, always clearly expressed and extends a bit below vein 2A. It is worth noting that this band comes into contact with the lower discal spot (i.e., is situated in the middle of the discal cell) in most of the specimens; in some cases they are separated by a narrow strip of light background colour. Both discal cell spots are not very wide; the lower one is clearly rectangular, while the upper one is slightly widened to the costal vein and slightly notched at the apical part of the discal cell. These spots are intensely black; the light field between them is usually equal to their width. The fw. basal area is covered with diffused, scarce dots over black scales.

In contrast to the fw., some elements of the hw. pattern are significantly reduced compared to other subspecies. Along the marginal part of the wing there is a distinct dark dashed line. The semitransparent dark part of the submarginal band is not wide and engulfs the spots. These spots are not large, oval-elongate; the suffusion with bluish scales on the spots is moderate, diffused, and it is almost totally absent on the upper spot (between veins M1 and Rs). The main differences lie in the elements of the postdiscal area; these elements are separated from the submarginal band by a wide field of light background. The posterior ocellus M is deformed in an interesting manner: in most of the specimens it is clearly divided into 2 unequal parts by a black stripe, which goes along vein M2. At the inner side the black rim of this ocellus is unusually zigzag-shaped; at the outer side the rim is thin and well pronounced. The white pupil in the upper part of the M-ocellus (between veins 1 and 2) is bright, with clear-cut borders, usually triangular; some specimens have a vague small pupil or just several white scales between veins 2 and 3. The anterior ocellus (costal eyespot) is small, sub-triangular, often completely black, without any red scales. Rarely some specimens with a developed costal eyespot have a white pupil on a red background. The anal-cubital spot is narrow and wavy with a limited area covered with red scales, rarely totally without them. Sometimes there is a faint, unclear dark suffusion in the field Cu1–3. The red colouration has an intensive carmine hue in fresh specimens but looks shaded because of well-developed black borders.

The pattern of the wing uns. is moderately contrasting, same as on ups. The black rim of the M-ocellus elongates proximally and has a shape of a short tooth with more or less sharpened top; the costal eyespot has a distinct triangular shape, and it is twice as big as its duplicate on the ups. The non-matching contours are well visible from the wing ups. (an assymmetry of this type is known in *P. ch. eugenia* only).

♀. The fw. length is 37–40 mm (wsp. 67–73 mm). The wings are more rounded and wide. The butterfly looks less contrasting: the background is the same as in ♂♂, but the dark pattern of the fw. is somewhat paler. The fw. marginal and submarginal bands are slightly wider. The postdiscal band is clearly separated from the lower discal spot by a 1.5–2 mm strip of light background colour. The

other features of the pattern are analogous to the ones in ♂♂.

The hw. pattern of ♀♀ is more different from ♂♂, with its elements more developed. The stroke marginal line is clearly seen in all specimens. The black submarginal ocelli are larger, round egg-shaped, but the blue suffusion on them is less developed and sometimes almost disappears. The submarginal band is clearly separated from the postdiscal spots by the wide strip of light background colour. The posterior ocellus M is larger, fully rounded, clearly bordered, with a whitish pupil in its upper part (between veins M1 and M2); rarely a small pupil appears in field 2–3. The hw. anterior ocellus (costal eyespot) is larger than in ♂♂, triangularly shaped, with smooth angles and a whitish pupil with vague contours. The anal-cubital spot is widened as in other subspecies, but the red field is always limited by vein Cu1. The black suffusion in field Cu1–3 usually looks like a vague, short appendage of the cubital spot, but it reaches to the M-ocellus in some specimens. The red colouration in fresh specimens has the same shaded carmine hue as in ♂♂.

In the hw. uns. pattern, the postdiscal M-ocellus has a less developed proximal projection than in ♂♂, the contour of this ocellus fits to its duplicate on the ups.; the costal eyespot exceeds the one on the ups. by approximately one third.

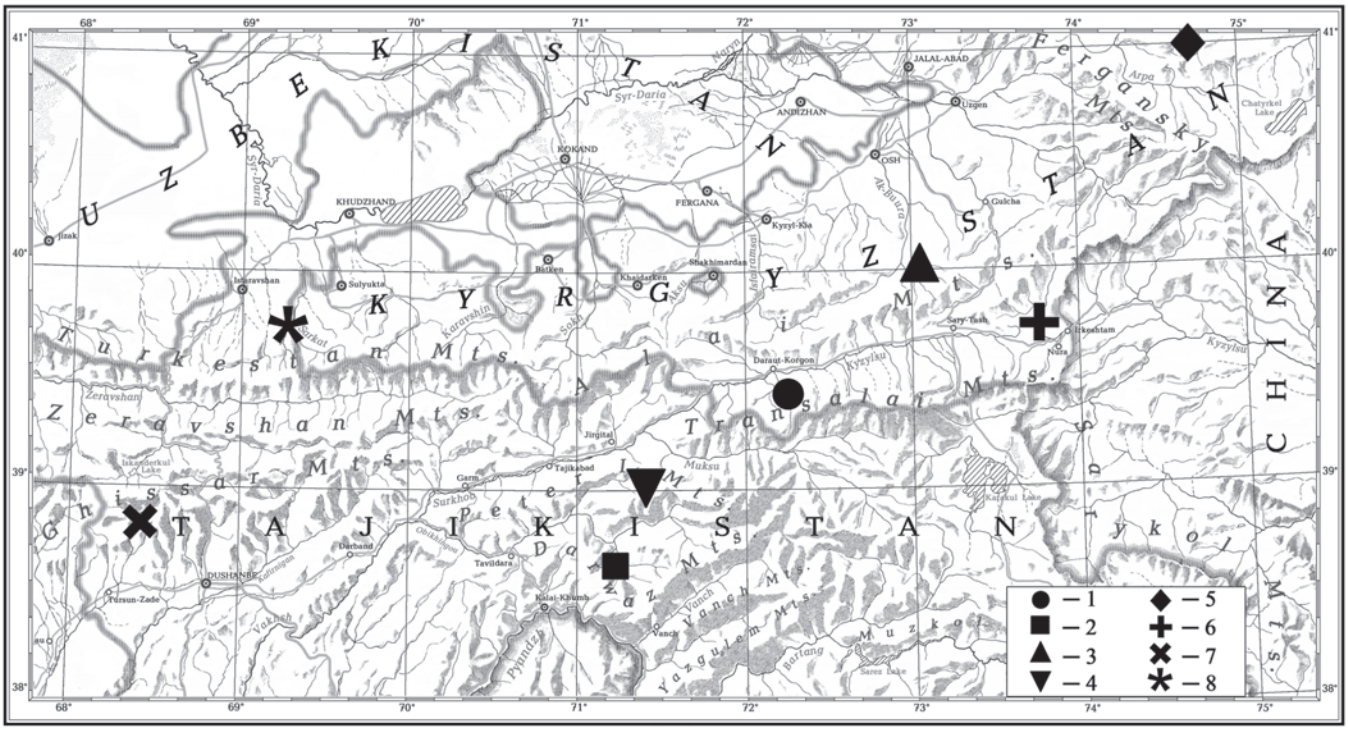
Variation and comparative diagnosis

♂♂. Approximately 20% of ♂♂ have the following features: the wings are more elongated; the central part of the fw. postdiscal band (field Cu1–3) is partly reduced; the hw. anterior ocellus is more developed, with some red colouration. The second (small) white pupil appears in the hw. postdiscal M-ocellus in ca. 30% of the ♂♂. The M-ocellus disjunctive line is absent in ca. 10% of the ♂♂. The field Cu1–3 is absolutely free of any black scales in 5–7% of the specimens.

♀♀. The part of the fw. postdiscal band in field Cu1–3 is stronger reduced in approximately 40% of the ♀♀. The hw. pattern is very stable: only in 7–8% of the ♀♀ there is no white pupil in the red costal eyespot, black scales are absent in field Cu1–3 between the anal-cubital spot and M-ocellus, a second white pupil appears in the M-ocellus.

Within the *romanovi*-complex, *P. ch. platon* differs in the following features:

- less developed sexual dimorphism — from all other subspecies except *P. ch. aenigma* and *P. ch. eugenia*;
- smaller size — from all other subspecies except *P. ch. eugenia* (according to the original description); a comparison is especially effective for ♀♀ which are often significantly larger than ♂♂ of other subspecies;
- less bright and contrasted colouration — firstly, from *P. ch. aenigma* and *P. ch. eugenia;* in the taxa with pronounced sexual dimorphism like *P. ch. romanovi*, *P. ch. sochivkoi* and *P. ch. varvara* only ♂♂ are more colour contrasted;
- the configuration and geometry of the fw.: strait fw. costal vein — from *P. ch. varvara* (it is slightly curved in its central part in both sexes of this taxa); and more rounded top of the wing in ♂♂ — from all other subspecies except *P. ch. ljudmilae*;
- the fw. pattern, which is very stable in both sexes: by the narrow marginal band with a smooth (not arch-



Map of the type localities. Legend: **1** = *Parnassius charltonius romanovi* Gr.-Gr.; **2** = *P. ch. vaporosus* Av.; **3** = *P. ch. sochivkoi* Chur.; **4** = *P. ch. eugenia* Chur.; **5** = *P. ch. varvara* Chur.; **6** = *P. ch. aenigma* Dub. & Mil.; **7** = *P. ch. ljudmilae* Les. & Kaab.; **8** = *P. ch. platon* ssp. n.

Plate 1: *Parnassius charltonius platon* ssp. n. **Figs. 1, 1a:** HT ♂, ups., uns. **Figs. 2, 2a:** PT ♂, ups., uns. Tajikistan, Turkestansky Mts. Range, Jangiaryk River, 1900 m, 27. VII. 2010, A. SOCHIVKO leg. **Figs. 3, 3a:** PT ♀, ups., uns., same data as HT. **Fig. 4:** PT ♀, ups., same data as HT. **Fig. 5:** Egg of *P. ch. platon* on a stone, Sarkat River valley. **Fig. 6:** *Corydalis schelesnowiana* RGL. & SCHMALH. 1881, larval host plant, Sarkat River.

Plate 2: several subspecies of *Parnassius charltonius* for comparison. **Fig. 7:** *P. ch. romanovi,* ♂, PLT: [in SHELJUZHKO's hand:] *princeps,* HONR. ♂, Aram-Kungei, Trans-Alai, GR[UM]-GR[SHIMAILO], 10. VII. [18]86, [and printed:] e coll. DECKERT, coll. L. SHELJUZHKO. **Fig. 8:** *P. ch. romanovi,* ♀, TPT: S. Kyrgyzstan, Transalai Mts., Aram-Kungei, 16. VII. 1994, 3500 m, A. SOCHIVKO leg. **Fig. 9:** *P. ch. vaporosus,* ♂: Tajikistan, W. Pamirs, Rushan Mts., Bishkun-Dara R., Porshnev vill. vicin., 17. VII. 1993, 3800 m, B. KHRAMOV leg. **Fig. 10:** *P. ch. vaporosus,* ♀: same loc., 27. VII. 1997, B. KHRAMOV leg. **Fig. 11:** *P. ch. eugenia,* ♀, HT: Tajikistan, Muksu R., 15. VIII. 2007, O. PAK leg. **Fig. 12:** *P. ch. eugenia,* ♂, PT: same loc., 15. VIII. 2009, S. SALUK leg. **Fig. 13:** *P. ch. sochivkoi,* ♂: S. Kyrgyzstan, Alai Mts., Kadamzhai distr., Eki-Daban R. (Aksu R. trib.), 26. VII. 2009, 3000 m, A. SOCHIVKO leg. **Fig. 14:** *P. ch. sochivkoi,* ♀: same data. **Fig. 15:** *P. ch. varvara,* ♂, PT: Kyrgyzstan, Inner Tian Shan, Dzhaman-Too Mts., Karasu R., 24. VII. 2008, 2900 m, S. CHURKIN, V. PLETNEV & S. SALUK leg. **Fig. 16:** *P. ch. varvara,* ♀, PT: same data. **Fig. 17:** *P. ch. ljudmilae,* ♂, PT: W. Tajikistan, Ghissar Mts., upper stream of Diakhan-Dara R., 40 km N Shakhrinav vill., 3700 m, 10. VIII. 1989, L. KAABAK leg. **Fig. 18:** *P. ch. ljudmilae,* ♀, PT: same loc., 13. VIII. 1989, L. KAABAK leg. **Fig. 19:** *P. ch. aenigma,* ♂ TPT, ex pupa: S. Kyrgyzstan, Nura vill. vicin., Koksu and Kyzylsu RR. confl., 1. VIII. 2004, 2850 m, A. SOCHIVKO leg.; hatched 22. VI. 2005, Moscow, Russia. **Fig. 20:** *P. ch. aenigma,* ♀ TPT, ex pupa: same loc., 2. VIII. 2004, 2850 m, A. SOCHIVKO leg.; hatched 15. V. 2005, Moscow, Russia. — All photos A. SOCHIVKO. Specimens approximately to the same size and only slightly smaller than natural size; in Plate 2 slightly smaller than in Plate 1.

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shaped) inner side — from *P. ch. aenigma*; by the wide and smooth (not arch-shaped) submarginal band — from all other subspecies except *P. ch. ljudmilae*; by the well developed postdiscal band which comes in contact with the lower discal spot in the majority of ♂♂ — from all other subspecies; by the shape of the upper discal spot which is widened towards the costal vein — from all other subspecies except *P. ch. ljudmilae* and *P. ch. eugenia* (in addition, the contours of this spot are vague in the latter subspecies);

- the degradation of some postdiscal spots on hw. ups. — from all other subspecies except *P. ch. eugenia;*
- the characteristic pattern of the hw. posterior ocellus M: by its obvious split into two parts by black stripe along vein M2 in ♂♂ — from all other subspecies (only in *P. ch. romanovi* there is the same tendency); by only one white pupil in this spot in most of specimens of both sexes — from *P. ch. ljudmilae*, *P. ch. aenigma* and *P. ch. sochivkoi* (in these taxa the second small white pupil is almost always present in both ♂♂ and ♀♀); by distinct contours and the size of this white pupil — from *P. ch. romanovi*, *P. ch. eugenia* and *P. ch. varvara* (in these taxa it is small and blurred); by the thin black rim of this spot at its external side — from *P. ch. ljudmilae* (it is unusually thick in this taxon); by the proximal tooth-shaped protrusion of the posterior ocellus M on hw. uns. — from all other subspecies except these 3: in *P. ch. eugenia* this protrusion is absent or less developed, in *P. ch. varvara* it is more developed and slightly curved like a bird's beak, and in *P. ch. aenigma* it is abnormally developed and clearly V-shaped;
- the shaded carmine hue of the hw. postdiscal spots — from all other subspecies except *P. ch. ljudmilae*. It is worth to note that the difference in colour gradation in some subspecies can serve as an obvious taxonomical feature. The tinge of the spots of 3 taxa, *P. ch. sochivkoi*, *P. ch. varvara* and *P. ch. eugenia,* is deep scarlet; in ♂♂ of *P. ch. romanovi* it is also deep scarlet but in ♀♀ is usually light scarlet or even vermilion (orangy red); the same spots in *P. ch. vaporosus* are faded, fulvous-vermilion. Finally, both sexes of *P. ch. aenigma* are decorated with contrasting, bright-carmine spots.

For more detailed description of all subspecies, see Churkin (2009).

Distribution and biology

P. ch. platon inhabits a small territory from the Sarkat River basin in the East (Kyrgyzstan) to the Jangiaryk River basin in the West (Tajikistan).

The biotope is located at record low altitudes for *P. charltonius:* 1500–1900 m. The imagines are on the wing during July — annually in approximately equal quantities of specimens, a phenomenon not known for any other population in the *romanovi* subspecies-group. Life conditions for the new subspecies are definitely unique in its ecological niche: population success benefits from the warm, mild climate and unlimited food resources. The butterflies prefer the conglomerate walls and loamy cliffs over the river, and some can also be seen higher, at the rocky protrusions in the middle zone of the mountains.

Until 2002 the lower boundary for the species *P. charltonius* was believed to be at 3000–3200 m (the population from Dugoba River, Yardan village, can now be treated as *P. ch. sochivkoi*). Later the outstanding subspecies *P. ch. aenigma* was described from the lower altitude of 2800–2900 m. In the period 2005–2008 we observed *P. charltonius* at the same altitudes in the western part of the Alai Mts., on the northern macroslopes, in the vicinity of the town of Aidarken. Finally, in 2008 we found the eggs of *P. charltonius* among the plants of *Corydalis heterophylla* Mikhailova 1982 in the Osh district, in the Ak-Buura River canyon, at 2000 m, which seemed to be a record low altitude level. The imagines, however, were not observed lower than ca. 2500–2600 m before.

The observed larval hostplant of *P. ch. platon* is *Corydalis schelesnowiana* Rgl. & Schmalh. 1881. The *Corydalis* plants grow abundantly in the habitats of these butterflies; growing along local watersheds down to the altitude of 1100 m, although the evidence of *P. charltonius* was not found there.

Concluding remarks

The common features with other subspecies support the idea, that in the past, before the rapid growth of the Pamir-Alai and the glaciation periods, they lived in the shared area of the Middle Asian macropopulation of *P. charltonius* or its ancestral form (Kreuzberg 1993, Churkin 2009). We can now clearly see the segregation of populations, their morphological and behavioral specific features, and often the hostplant specialization (Mikhailova & Sochivko 2011). Probably, some populations still exchange genes (Churkin 2009), but the zoogeographical research suggests total isolation of the following taxa: *P. ch. ljudmilae*, *P. ch. varvara*, *P. ch. aenigma*, and, most likely, *P. ch. platon*. The observed altitudes of the inhabitated biotopes (at 1500–1900 m) almost surely prevent contact with the neighboring populations eastward and south-eastward, where the climate is governed by the Matcha Mountain-Knot with its large territory of glaciers, and where the mountains become higher and colder. Southwards from the type locality the migration paths are blocked by the mighty barrier of the Turkestansky range. We may hypothesise that evidence of a movement of *P. ch. platon* across the Ghissar-Alai will be found in future from the western side. Here the predominant flow of hot and dry air masses from the deserts of Kyzyl-Kum and Kara-Kum and the lower absolute altitudes make mountains potentially more attractive for thermophilic animals and plants.

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